REMARKS

Claims 1-22 are pending in this application. Claim 1 is independent. Claim 18 is withdrawn from consideration.

The present invention provides a continuous process for the preparation of filled rubber granules from rubber latex emulsions by precipitation from aqueous mixtures. Specification at page 1, lines 9-10. Conventional problems associated with the use of continuous tubular reactors to prepare filled rubber granules are surprisingly solved by the present invention using continuous stirred tank reactors. Specification at page 4, lines 10-11.

Claims 1-17 and 19-22 are rejected under 35 U.S.C. §103(a) over U.S. Patent No. 6,348,522 ("Smigerski-522") in view of U.S. Patent No. 5,585,524 ("Sielcken") and U.S. Patent No. 5,656,757 ("Jenczewski").

Claims 1-17 and 19-22 are rejected under 35 U.S.C. §103(a) over U.S. Patent No. 4,788,231 ("Smigerski-231") in view of Sielcken and Jenczewski.

Claims 1-17 and 19-22 are rejected under 35 U.S.C. §103(a) over U.S. Patent Application Publication No. US 2002/0091190 A1 ("Goerl") in view of Sielcken and Jenczewski.

Claims 1-17 and 19-22 are rejected on the ground of nonstatutory obviousness-type double patenting over Claims 1, 5, 7, 10-11, 13 and 17 of U.S. Patent No. 6,878,759 in view of in view of Sielcken and Jenczewski.

Smigerski-522 discloses a process for continuous preparation of filler-containing rubber powders in which a liquid mixture is passed through a tube. Smigerski-522 at Abstract. In this process, the filler suspensions and the rubber emulsions are metered continuously into a tubular reactor. Under these conditions, inadequate intermixing of filler and rubber emulsion can be expected, leading to inhomogeneous products.

Smigerski-231 discloses a process, which can be carried out either continuously or discontinuously, for preparing a pourable powder rubber containing filler. Smigerski-231 at Abstract; column 4, lines 50-51. Smigerski-231 discloses that the continuous mode of operation can be in a tube. Smigerski-231 at column 4, lines 60-64.

Goerl discloses a process for preparing silica-filled rubber powder that can be carried out either batchwise or continuously. Goerl at Abstract; [0047].

The claims of the '759 patent disclose a process in which a step b) of contacting a rubber latex emulsion and a suspension containing a filler is carried out with stirring. See Claim 16 of '759.

However, Smigerski-522, Smigerski-231, Goerl and the claims of the '759 patent fail to suggest the independent Claim 1 limitation of "continuously and simultaneously feeding an aqueous filler mixture comprising at least one filler, and an aqueous rubber emulsion or latex into a reactor system ..., wherein the reactor system comprises two or more ***continuous stirred tank reactors*** **in series**".

The Final Rejection admits that "Smigerski et al '522 in view of Sielcken et al fail to teach that two or more reactors connected in series (a reactor system) are used (Claim 1)" (page 4, lines 8-9); "Smigerski et al '231 do not expressly teach that the continuous process can be carried out in stirred reactors connected in series (Claim 1)" (page 5, lines 2-3); "Goerl et al do not expressly teach that the continuous process can be carried out in stirred reactors connected in series (Claim 1)" (page 5, lines 27-28).

The Final Rejection asserts:

> Obviously, if **different types of filler-containing rubber powders** or a **doubled amount of rubber powde**r should be produced, two or more reactors **in series** (a reactor system) would be used, e.g., each reactor for each type of filler-containing rubber powder.
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> ... Therefore, it would have been obvious to one or ordinary skill in the art at the time the invention was made to have provided two or more CSTR **in series** (a reactor system) in Smigerski et al '522 in view of Sielcken et al with the expectation of providing the desired **at least two types of filler containing rubber powders** or a **doubled amount of rubber powder** depending on particular customer request. Final Rejection at page 4, lines 9-18 (emphasis added).

On the contrary, because all material passing through reactors **in series** must pass through each of the reactors, one skilled in the art would not expect reactors **in series** to provide "at least two types of filler containing rubber powders" or a "doubled amount of rubber powder". In order to provide "at least two types of filler containing rubber powders" or a "doubled amount of rubber powder", the skilled artisan might use reactors **in parallel**, and not independent Claim 1's reactors **in series**.

Thus, the primary references in view of Sielcken fails to suggest the independent Claim 1 limitation that "the reactor system comprises two or more continuous stirred tank reactors in series".

Jenczewski discloses a continuous process that can use at least three stirred tank reactors connected in series. Jenczewski at column 4, lines 28-30. However, Jenczewski has nothing in common with the above-identified application. Jenczewski describes the recovery of caprolactam from nylon 6 wastes.

As discussed above, the process of the present invention using continuous stirred tank reactors solves in a surprisingly simple manner a variety of problems associated with the tubular reactors of the cited prior art. Specification at page 4, lines 10-11. Regarding tubular reactors, the specification discloses:

> The **tubular reactors** described by way of example have very low flow rates and give inadequate mixing of filler and rubber emulsion and therefore very inhomogeneous products. In addition, the **very *short* residence times (about 5 s)** appear to be **insufficient to complete the coagulation** of the rubber (in particular of natural latex). ... [T]his would lead to a requirement for a downstream mixer.
>
> Another expected limitation of this process is a ***fixed* residence time** in the apparatus due to the fixed tube length. This may **restrict uses of the apparatuses to only one particular mixing specification** and, furthermore, may **make the apparatus very susceptible to variations in the properties of the starting materials**, e.g., the coagulation behavior thereof or emulsion.
>
> In addition, considerable **blockage problems** may be expected due to the properties of the latex and due to the fact that a tube is a vessel with **very *high* specific surface area (ratio of wall area to reactor volume)**. A result of very low flow rates and the incorporation of additional constrictions (flow restrictor sections and static mixtures), is an increased risk of blockage and inability to prepare the products reproduceably. Specification at page 3, lines 4-18 (emphasis added).

In contrast to continuous tubular reactors, the **continuous stirred tank reactors** of the present invention have a relatively ***low* specific surface area** (ratio of wall area to reactor volume) which greatly decreases the risk of blockage. In addition, the continuous stirred tank reactor has a relatively ***long average* residence time** (see, e.g., specification at page 10, lines 24-25 (**0.8 min**); page 11, line 12 (**11 min**); page 12, line 2 (**11 min**); page 12, lines 24-25 (**23 min**)) which ensures complete coagulation of the rubber and tolerates variations in process parameters.

Compared to the continuous tubular reactors of the cited prior art, the continuous stirred tank reactors of the present invention provide significant improvements in avoidance of apparatus blockage, tolerance in relation to variations in properties of starting materials, and limitations on variations in formulations. Specification at page 3, lines 28-31.

Because the cited prior art fails to suggest the "two or more continuous stirred tank reactors in series" of independent Claim 1, or the significant improvements associated with the process of independent Claim 1 using "continuous stirred tank reactors", the rejections

under 35 U.S.C. §103(a) and on the ground of nonstatutory obviousness-type double patenting should be withdrawn.

The claims are further patentably distinguishable over Smigerski-231 because the method of Smigerski-231 is fundamentally different than the process of independent Claim 1. According to Smigerski-231, the amount of carbon black filler is divided, and the second amount of carbon black is to be added to the base particles of powdered rubber *after the end of precipitation* (see Smigerski-231 at column 6, Examples 1 to 4).

> After passing through the usual viscosity increase, the precipitation was completed within approximately 10 seconds after adding the acid. With further stirring, a suspension of 157 g of water and 10 g of the aforementioned carbon black was metered in. Smigerski-231 at column 6, lines 31-36.

Thus, the second addition of carbon black takes place only after precipitation of the powdered rubber. By this method the carbon black is not anchored in the peripheral shell, but instead it creates a kind of powdering effect. At first, these products are also free-flowing. However, over the long term the outer layer of carbon black is removed by friction, etc., and so the tackiness increases.

Furthermore, in Smigerski-231 carbon black migrates from the interior of the particles to the peripheral zone due to removal of moisture. Consequently, these products are not reproducible with regards to the carbon black content, and over the long term they become tackier than the inventive products.

Because Smigerski-231 fails to suggest the independent Claim 1 limitations of "continuously and simultaneously feeding an aqueous filler mixture comprising at least one filler, and an aqueous rubber emulsion or latex into a reactor system through separate feedlines to coagulate rubber on the surface of the filler and form a precipitation suspension of filled rubber granules", the claims are further patentably distinguishable over Smigerski-231.

Claims 1-17 and 19-22 are rejected under 35 U.S.C. §112, second paragraph, because assertedly the recitation "two or more continuous stirred tank reactors in series" is indefinite. However, the term "continuous stirred tank reactor" is well known in the art. See, e.g., Chemical Engineer's Handbook, 5th edition, pages 4-20 to 4-26 (esp. Fig. 4-3)(copy attached). Thus, the recitation "two or more continuous stirred tank reactors in series" is not indefinite. As a result, the rejection under 35 U.S.C. §112, second paragraph, should be withdrawn.

After independent process Claim 1 is allowed, Applicants respectfully request rejoinder and allowance of withdrawn process Claim 18, which depends from independent process Claim 1.

In view of the foregoing amendments and remarks, Applicants respectfully submit that the application is in condition for allowance. Applicants respectfully request favorable consideration and prompt allowance of the application.

Should the Examiner believe that anything further is necessary in order to place the application in even better condition for allowance, the Examiner is invited to contact Applicants' undersigned attorney at the telephone number listed below.

Respectfully submitted,

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Attached:
Chemical Engineer's Handbook, 5th edition, pages 4-20 to 4-26